

CLAIMS

WHAT IS CLAIMED:

1. A device adapted to have a working fluid flow therethrough, said device comprising:
 - 5 a body;
 - a valve stem operatively coupled to a gate positioned in said body;
 - a valve stem seal positioned around said valve stem, wherein a sealed cavity exists above said valve stem seal; and
- 10 an opening in fluid communication with said sealed cavity and an interior region of said body, said opening allowing a pressure of said working fluid to be exerted in said sealed cavity above said valve stem seal.
2. The device of claim 1, wherein said opening extends through at least a portion 15 of said body.
3. The device of claim 1, wherein said opening extends through a bonnet coupled to said body.
- 20 4. The device of claim 1, wherein said opening extends through a bonnet that is formed integrally with said body.
5. The device of claim 1, wherein said valve stem is operatively coupled to a roller screw.

6. The device of claim 1, wherein said valve stem seal is a bi-directional seal.

7. The device of claim 3, wherein said sealed cavity is at least partially defined by a bonnet cap that is coupled to said bonnet.

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8. The device of claim 3, wherein said sealed cavity is at least partially defined by a bonnet cap that is coupled to said bonnet, a seal between said bonnet and said bonnet cap, and said valve stem seal.

10 9. A device adapted to have a working fluid flow therethrough, said device comprising:

a body;

a bonnet coupled to said body;

a valve stem operatively coupled to a gate positioned in said body;

15 a valve stem seal positioned between said valve stem and said bonnet, wherein a sealed cavity exists above said valve stem seal; and
an opening through said bonnet that allows a pressure of said working fluid to be exerted in said sealed cavity above said valve stem seal.

20 10. The device of claim 9, wherein said valve stem is operatively coupled to a roller screw.

11. The device of claim 9, wherein said valve stem seal is a bi-directional seal.

12. The device of claim 9, wherein said sealed cavity is at least partially defined by a bonnet cap that is coupled to said bonnet.

5 13. The device of claim 9, wherein said sealed cavity is at least partially defined by a bonnet cap that is coupled to said bonnet, a seal between said bonnet and said bonnet cap, and said valve stem seal.

10 14. A device, comprising:
a body;
a bonnet coupled to said body;
a valve stem operatively coupled to a gate positioned in said body;
a valve stem seal positioned between said valve stem and said bonnet, wherein a sealed cavity exists above said valve stem seal; and
an opening through said bonnet, said opening being in fluid communication with said
15 sealed cavity and an interior region of said body.

15. The device of claim 14, wherein said valve stem is operatively coupled to a roller screw.

20 16. The device of claim 14, wherein said valve stem seal is a bi-directional seal.

17. The device of claim 14, wherein said sealed cavity is at least partially defined by a bonnet cap that is coupled to said bonnet.

18. The device of claim 14, wherein said sealed cavity is at least partially defined by a bonnet cap that is coupled to said bonnet, a seal between said bonnet and said bonnet cap, and said valve stem seal.

5 19. A device adapted to have a working fluid flow therethrough, said device comprising:

a body;

a valve stem operatively coupled to a gate positioned in said body;

a valve stem seal positioned around said valve stem, wherein a sealed cavity exists

10 above said valve stem seal; and

an opening through said body that allows a pressure of said working fluid to be exerted in said sealed cavity above said valve stem seal.

15 20. The device of claim 19, wherein said valve stem is operatively coupled to a roller screw.

21. The device of claim 19, wherein said valve stem seal is a bi-directional seal.

20 22. A device adapted to have a working fluid flow therethrough, said device comprising:

a body;

a bonnet coupled to said body;

a valve stem operatively coupled to a gate positioned in said body;

25 a valve stem seal positioned between said valve stem and said bonnet, wherein a sealed cavity exists above said valve stem seal; and

an opening through said bonnet that allows said working fluid to enter said sealed cavity, thereby exerting a pressure of said working fluid in said sealed cavity above said valve stem seal.

5 23. The device of claim 22, wherein said valve stem is operatively coupled to a roller screw.

10 24. The device of claim 22, further comprising a filter positioned in a recess formed in said bonnet over said opening so as to filter said working fluid flowing through said opening in said bonnet and into said sealed cavity.

15 25. The device of claim 22, wherein said valve stem seal is a bi-directional seal.

20 26. The device of claim 22, wherein said sealed cavity is at least partially defined by a bonnet cap that is coupled to said bonnet.

25 27. The device of claim 22, wherein said sealed cavity is at least partially defined by a bonnet cap that is coupled to said bonnet, a seal between said bonnet and said bonnet cap, and said valve stem seal.

20 28. A device adapted to have a working fluid flow therethrough, said device comprising:

25 a body;
 a bonnet coupled to said body;
 a valve stem operatively coupled to a gate positioned in said body;

a bonnet cap coupled to said bonnet;

a roller screw assembly operatively coupled to said valve stem, said roller screw assembly comprising a housing, a portion of which extends through said bonnet cap;

5 a first valve stem seal positioned between said valve stem and said bonnet, a second seal positioned between said bonnet cap and said bonnet, and a third seal positioned between said bonnet cap and said housing, wherein a sealed cavity exists above said first valve stem seal, said sealed cavity being defined by a portion of said bonnet cap, said first valve stem seal, said second seal and said

10 third seal; and

an opening through said bonnet that allows said working fluid to enter said sealed cavity, thereby exerting a pressure of said working fluid in said sealed cavity above said valve stem seal.

15 29. The device of claim 28, further comprising a filter positioned in a recess formed in said bonnet over said opening so as to filter said working fluid flowing through said opening in said bonnet and into said sealed cavity.

20 30. The device of claim 28, wherein said first valve stem seal is a bi-directional seal.

31. A device, comprising:

a body;

a valve stem operatively coupled to a gate positioned in said body;

a valve stem seal positioned around said valve stem, wherein a sealed cavity exists above said valve stem seal;

a piston chamber, said piston chamber being in fluid communication with said sealed cavity and an interior region of said body; and

5 a piston positioned in said piston chamber.

32. The device of claim 31, wherein said piston chamber is formed in a bonnet that is coupled to said body.

10 33. The device of claim 31, wherein said piston chamber is formed in a portion of said body.

34. The device of claim 31, wherein said valve stem is operatively coupled to a roller screw.

15 35. The device of claim 31, further comprising a piston retaining ring that is adapted to retain said piston in said piston chamber.

20 36. The device of claim 35, further comprising a filter positioned between said piston and said interior region of said body.

37. The device of claim 35, further comprising:

a filter positioned between said piston and said interior region of said body; and

a filter support ring to retain said filter in position, said filter support ring being 25 threadingly coupled to said piston retaining ring.

38. The device of claim 31, wherein said valve stem seal is a bi-directional seal.

39. The device of claim 31, wherein said sealed cavity is at least partially defined

5 by a bonnet cap.

40. The device of claim 31, further comprising a seal positioned between said piston and said piston chamber.

10 41. The device of claim 31, further comprising a hydraulic fluid positioned in said sealed cavity above said piston, wherein said hydraulic fluid is adapted to be substantially isolated from said working fluid by said piston.

42. A device, comprising:

15 a body;

a bonnet coupled to said body;

a valve stem operatively coupled to a gate positioned in said body;

20 a valve stem seal positioned between said valve stem and said bonnet, wherein a sealed cavity exists above said valve stem seal;

a piston chamber formed in said bonnet, said piston chamber being in fluid communication with said sealed cavity and an interior region of said body; and

25 a piston positioned in said piston chamber.

43. The device of claim 42, wherein said valve stem is operatively coupled to a

25 roller screw.

44. The device of claim 42, further comprising a piston retaining ring that is threadingly coupled to said bonnet, said piston retaining ring being adapted to retain said piston in said piston chamber.

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45. The device of claim 44, further comprising a filter positioned in said bonnet between said piston and said interior region of said body.

46. The device of claim 44, further comprising:
10 a filter positioned in said bonnet between said piston and said interior region of said body; and
a filter support ring to retain said filter in position, said filter support ring being threadingly coupled to said piston retaining ring.

15 47. The device of claim 42, wherein said valve stem seal is a bi-directional seal.

48. The device of claim 42, wherein said sealed cavity is at least partially defined by a bonnet cap that is coupled to said bonnet.

20 49. The device of claim 42, wherein said sealed cavity is at least partially defined by a bonnet cap that is coupled to said bonnet, a seal between said bonnet and said bonnet cap, and said valve stem seal.

25 50. The device of claim 42, further comprising a seal positioned between said piston and said piston chamber.

51. The device of claim 42, further comprising a hydraulic fluid positioned in said sealed cavity above said piston, wherein said hydraulic fluid is adapted to be substantially isolated from said working fluid by said piston.

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52. A device, comprising:

a body;

a bonnet coupled to said body;

a valve stem operatively coupled to a gate positioned in said body;

10 a bonnet cap coupled to said bonnet;

a roller screw assembly operatively coupled to said valve stem, said roller screw assembly comprising a housing, a portion of which extends through said bonnet cap;

a first valve stem seal positioned between said valve stem and said bonnet, a second

15 seal positioned between said bonnet cap and said bonnet, and a third seal positioned between said bonnet cap and said housing, wherein a sealed cavity exists above said first valve stem seal, said sealed cavity being defined by a portion of said bonnet cap, said first valve stem seal, said second seal and said third seal;

20 a piston chamber formed in said bonnet, said piston chamber being in fluid communication with said sealed cavity and an interior region of said body; and a piston positioned in said piston chamber.

53. The device of claim 52, further comprising a piston retaining ring that is threadingly coupled to said bonnet, said piston retaining ring being adapted to retain said piston in said piston chamber.

5 54. The device of claim 53, further comprising a filter positioned in said bonnet between said piston and said interior region of said body.

10 55. The device of claim 53, further comprising:
a filter positioned in said bonnet between said piston and said interior region of said body; and
a filter support ring to retain said filter in position, said filter support ring being threadingly coupled to said piston retaining ring.

56. The device of claim 52, wherein said valve stem seal is a bi-directional seal.

15 57. The device of claim 52, further comprising a seal positioned between said piston and said piston chamber.

20 58. The device of claim 52, further comprising a hydraulic fluid positioned in said sealed cavity above said piston, wherein said hydraulic fluid is adapted to be substantially isolated from said working fluid by said piston.

25 59. A device adapted to have a working fluid flow therethrough, said device comprising:
a body;

a bonnet coupled to said body;
a valve stem operatively coupled to a gate positioned in said body;
a valve stem seal positioned between said valve stem and said bonnet, wherein a sealed cavity exists above said valve stem seal; and
5 means for allowing a pressure of said working fluid to be exerted in said sealed cavity while preventing said working fluid from entering said sealed cavity.

60. The device of claim 59, wherein said means comprises a piston positioned in a piston chamber formed in said body, said piston chamber being in fluid communication with 10 said sealed cavity and an interior region of said body.

61. The device of claim 59, wherein said means comprises an opening through said valve body that is in fluid communication with said sealed cavity and an interior region of said body.

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62. The device of claim 59, further comprising a roller screw operatively coupled to said valve stem.

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63. The device of claim 60, further comprising a filter positioned in a recess in said bonnet upstream of said piston.

64. The device of claim 60, further comprising a piston retaining ring that is threadingly coupled to said bonnet.

65. The device of claim 63, further comprising a filter support ring to retain said filter.